



# 712CD

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Please use the same title listed on the 75<sup>TH</sup> MORSS Disclosure Form 712 A/B. If the title of the presentation has changed please list both.)

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If the title was revised please list the original title above and the revised title here: Using Expressive Commerce™ to Support Defense Mobility and Transportation Planning

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# **Changing the Game**

## **Using Expressive Commerce™ to Support Defense Mobility and Transportation Planning**

### **Presented to Working Group 18 Mobility and Transport of Forces**

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# Agenda

- ***Team and Technology***
- ***Commercial Experience with CombineNet Technology***
- ***Possible Military Uses for CombineNet Technology in Defense Transportation and Mobility Planning***
- ***Summary and Conclusions***

## Working Group 18

- **State-of-the-art technology**
- **End-to-end analysis of mobility and transportation requirements**
- **Support senior-level decision-makers with timely analyses**



# Team Overview

## **PricewaterhouseCoopers** **(PwC)**

***One of the largest integrated professional services firms in the United States serves the U.S. Federal Government through our Washington Federal Practice (WFP). PwC's WFP dedicated team of multi-disciplined professionals offer deep technical expertise and innovative solutions to provide seamless services to our government clients.***

- ***Founded in 1916***
- ***Privately held: 120,000 employees worldwide (84,000 in 84 offices in US)***
- ***Global Presence: Europe, Asia, Australia, Africa, Middle & Far East***
- ***Federal Government Focus with Commercial & Government reach back***

## **CombineNet, Inc.**

***A technology company staffed with world class operations research and combinatorial scientists and seasoned industry executives. CombineNet's Decision Guidance Tools are applied across government and commercial enterprises to assist decision makers in the fields of strategic sourcing, transportation and logistics, healthcare, energy, homeland security, and advanced optimization / planning applications.***

- ***Founded in 2000***
- ***Carnegie Mellon University***
- ***Privately held: 120 employees***
- ***International Presence: Pittsburgh, Washington DC, Berlin, Hamburg, Beijing, Tokyo***
- ***Primarily Fortune 200 Clients***



# PwC & CombineNet Team

## Technical & Domain Expertise

### **PwC Technical Expertise**

- **Financial Management**
- **Supply Chain**
- **Strategic Sourcing**
- **Privatization & Outsourcing**
- **Performance-Based Management**
- **Lean 6 Sigma**
- **IT Security & Controls**
- **IT and Financial Effectiveness**
- **IT ERP Expertise (SAP, Oracle, etc.)**
- **Program Management**
- **Portfolio Management**
- **Global Best Practices Database**

### **PwC Domain Expertise**

- **Colonel (Ret.) Charley Mitchell**
- **Colonel (Ret.) Dan Bartlett**
- **Colonel (Ret) Bob Speer**
- **Mike Schwed (Colonel, USAR)**
- **Battle Captains**

### **CombineNet Technical Expertise**

- **Dr. Tuomas Sandholm** (Founder, Chairman, and Chief Scientist)
  - Professor Of CS, Carnegie Mellon Univ.; Sloan Fellow
  - Winner: 2003 Computers And Thought Award; 2006 AAAI Innovative Applications of Artificial Intelligence
- **Dr. Subhash Suri** (Chief Algorithms Architect)
  - Professor of CS, University of California at Santa Barbara
- **Dr. David Levine** (VP, Research & Development)
  - Former Affiliate Professor of CS and Former Director Of The Center For Distributed Object Computing WUSTL
- **Dr. George Nemhauser**
  - A. Russell Chandler Chaired Professor in ISyE, Georgia Institute of Technology
  - Author Of The Standard Textbooks On Mixed Integer Programming

### **CombineNet Domain Expertise**

- **General (Ret.) Lester Lyles**
- **General (Ret.) Wesley Clark**
- **LTG (Ret.) Gus Pagonis**
- **Dr. Michael Goldblatt**
  - Former Director of Defense Sciences - DARPA



# Technologies

- ***Expressive Commerce™***
  - *Advanced Sourcing Application Platform – ASAP*
  - *Expressive competition*
  - *Expressive allocation evaluation*
- ***Combinatorial Optimization***
  - *Hundreds of thousands – millions – of variables*
  - *Thousands of constraints, criteria, and/or business rules*
- ***Solving speed***
  - *World's fastest decision tree search algorithms*
  - *Solves most problems in seconds*

## **Optimization**

The ability to deal with the natural complexity of ever-changing markets, selecting the optimal decision available amongst the thousands, indeed millions of alternatives which deserve consideration

## **Expressive Commerce™**

The ability to collaborate, capture and consider the alternative approaches to innovation, capacity, product/process creativity and cost/value leverage which may be provided by an increasingly sophisticated supply base



# CombineNet Approach to Decision Making

## Components

- **Expressive Commerce™ – State-of-the Art Technology**
  - *A richer, more collaborative marketplace for buyers and suppliers*
  - *Suppliers innovate to deliver their absolute best offers based on their strengths and your business needs*
- **Iterative Scenario Analysis – End-to-End Analysis**
  - *Uncover the cost trade-offs between must-have and nice-to-have business rules and criteria*
  - *Identify the difference between potential and implementable savings*
- **Applied Optimization – Support Senior-Level Decision Makers with Timely Analyses**
  - *Analyze and compare potential award scenarios in seconds to find the optimal allocations*

## Uses

- **Sourcing**
  - *Transportation*
  - *Distribution*
  - *Raw Materials*
  - *Finished Components*
  - *Packaging*
  - *Services*
- **Other**
  - *Resource Allocation*
  - *Network Design and Optimization*
  - *Option / Alternative Evaluation*

- **Created By The 10 Leading Experts**
  - **Proven in Leading Companies**



# Concept

- ***Express alternatives in significant detail – offers, bids, capability...***
  - ***Model decision maker's criteria, constraints, and business rules***
  - ***Conduct the event in a structured electronic environment***
  - ***Algorithmically match alternatives and criteria – finely grained match to determine an optimal solution***
  - ***Vary criteria and constraints – scenario management – and re-optimize***
- ***CombineNet takes these highly expressive supply and demand statements...***
    - ***Automatically converts them into an optimization model;***
    - ***Uses sophisticated tree search algorithms to solve the model; and***
    - ***Sorts through the millions of options you could select to find the one you should select...quickly***

**Control and exploit complexity**



# Exclusive Advantages

- **Power**

- Collect bids & alternative offers
- Help suppliers to provide creative proposals
- Suppliers avoid exposure risks – reduces hedging

- **Speed**

- Quickly analyze & identify the best options
- Iterate & compare alternatives rapidly
- Model and quantify best value decisions

- **Usability**

- Express stakeholder goals in biddable terms
- Capture buyer and supplier side constraints
- Find true cost of sourcing decisions – transparency
- Find implementable solutions

- **Real World**

- Comprehensive scenario creation and management
- Real time change and situation modeling
- Easily train and supervise less experienced procurement officials
- Time to contract: months become weeks
- Identify additional “hidden” savings and reduce program management costs

*A Recent Sourcing  
Example:*

- 3 major buyers
- 18,000 line items
- 259,533 bids
- 143,687 expressive bids
- 225 suppliers
- 2,910 Scenarios
- Average solve time <15 seconds/scenario
- Savings ~15% on \$1B spend



## Case Study: Sourcing in Quasi-Governmental Organizations



UNITED STATES  
POSTAL SERVICE

- **Challenge:** Transform supply chain to achieve significant cost savings
- **Solution:** Leverage CombineNet's strategic sourcing technology across multiple portfolio groups to identify better, more cost effective vendor solutions
- **Results:**
  - Technology is transforming the USPS Supply Chain team through better, faster, more strategic decisions
  - Categories sourced include transportation (airfreight, ocean freight and holiday season truckload shipping), services (trash and recycling removal, vehicle wash), mail equipment materials (mail containers and pallet boxes), and fuel for fleet vehicles.
  - Enabled a transparent sourcing environment allowing objective, best value award decisions
- **Highlights:**
  - Roughly \$1 billion in spend sourced through CombineNet software
  - 35X Return on Investment
  - Agreement recently renewed for 2 more years



# Case Study: Improving Execution

- ***Transportation lanes bundled by purchaser***
  - *Groups of 600 lanes – origin/destination pairs*
  - *Grouped for convenience of buyer and simplifying decision-making*
- ***Outcome***
  - *Grouping becomes “price of entry”*
  - *Encouraged hedging by suppliers*
  - *Forced over commitment by smaller suppliers and added cost by larger suppliers*
- ***Improvements from Expressive Commerce™***
  - *Suppliers offer and group according to capability and best terms – suppliers play to own strengths and most efficient delivery*
  - *Suppliers focus on the components/segments where they excel*



## Case Study: Eliminating Unnecessary Constraints

- *Internal stakeholders required roll up doors on commercial trucks and trailers*
- *Expressive Commerce™ process permitted suppliers to offer alternative equipment (“bat wing” doors) and provided analytics to rapidly evaluate alternatives*
- *Clear financial advantage emerged indicating significant savings were achievable if the roll up door requirement could be relaxed*
- *Managers isolated the requirement and stakeholder and were able to change the requirement without affecting performance*
- *Outcome – multi-million dollar recurring savings*



## Case Study: Advanced Sourcing Optimization in CPG Acquisition

- ***Large consumer products goods (CPG) company has used CombineNet since 2002 across dozens of direct and indirect areas of its purchasing.***
- ***Highlights:***
  - ***More than \$10 Billion in Procurement spend to date***
  - ***Growing to nearly 30%+ of total procurement spend***
  - ***More than \$1 Billion in identified savings***
- ***Results:***
  - ***Combinatorial optimization has allowed supply chain to model problems that were previously unsolvable***
  - ***Leaner, yet more reliable supplier networks***
  - ***Cost and service based competitive advantage***
  - ***New best practices become retained organizational assets***



# CPG

## 2005 Transportation Review

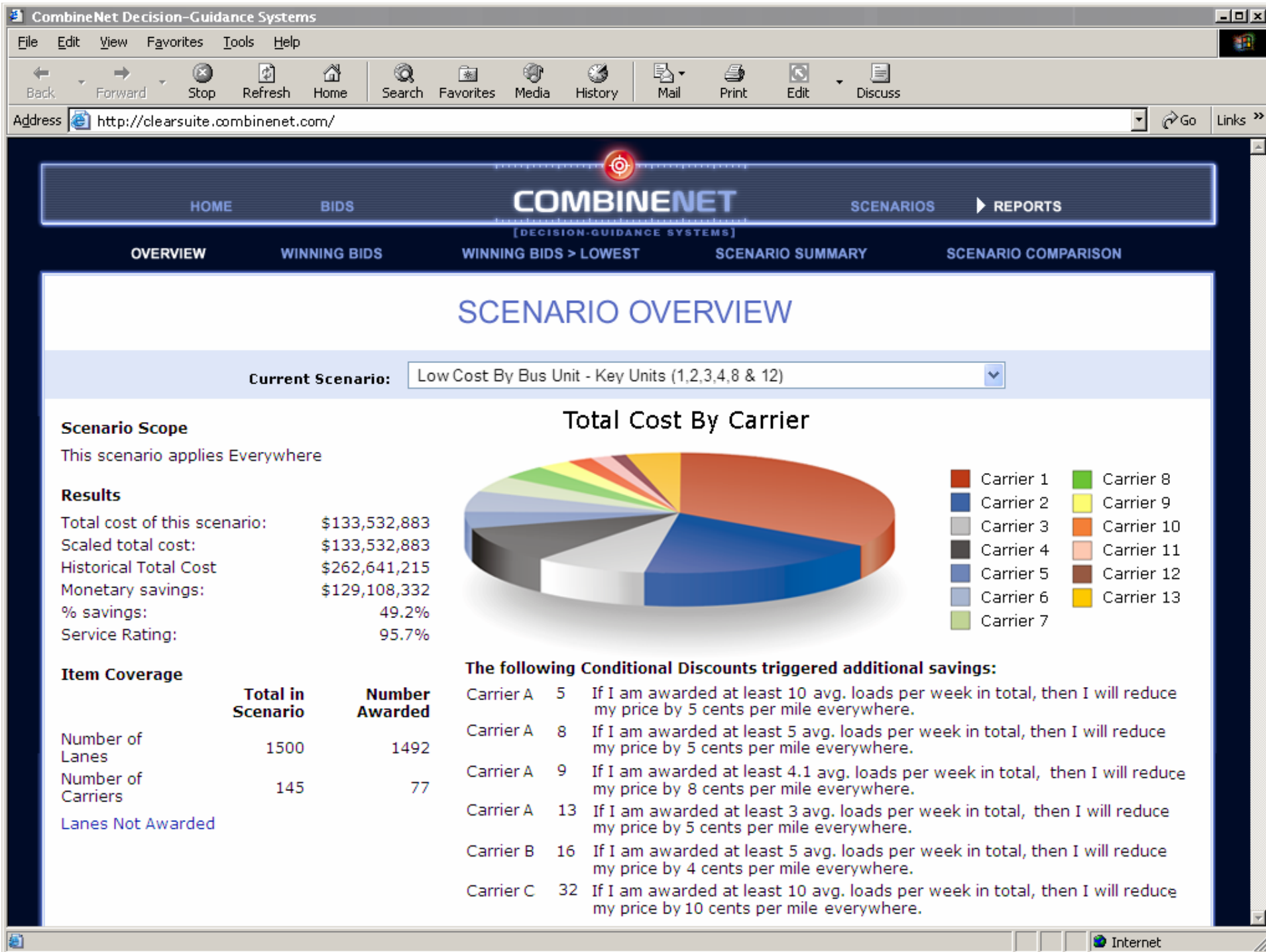
- ***Truckload rates are to increase 4.6%***
  - *~ matches the 2004 increase*
  - *others identify 6-15% increase*
- ***LTL rates to increase 4.3%***
  - *~ matches the 2004 increase*
- ***Air Cargo rates to increase 4.6%***
  - *> double the 2004 increase*
- ***Ocean Freight rates to increase 3.9%***
  - *Considerably less than 2004*
- ***Express and Parcel rates ton increase 3.8%***
  - *Less than any other mode*
- ***Why?***
  - *Higher Fuel Costs*
  - *Capacity Shortages*

- **Estimated Transportation Cost Increase of 6-12% in 2006 for Fortune 500 companies – AberdeenGroup**
- **Shippers brace for higher fuel surcharges this fall – “Inbound Logistics”**



# CPG Addressing Market Changes

- **Challenge:** *Support senior-level decision-makers with timely analyses*
  - Reduce total cost of North American Truckload transportation
  - Balance price and non-price factors in award allocation (service levels, incumbency, etc.); improve supplier relationships
  - Shorten bid processing cycle for quicker, more implementable results
  - 8600+ lanes; more than 25,000 lane details; 148 carriers
- **Solution:**
  - CombineNet enables “Expressive Bidding” - allowing carriers to provide creative bids across any combination of lanes, equipment types, conditional offers, etc. – *State-of-the-art technology*
  - CombineNet’s Scenario Builder enables the transportation sourcing team to view total transportation cost by lane and in aggregate based on analysis of carriers’ Expressive Bids against corporate business rules
    - Includes price and non-price factors: carrier characteristics, capabilities, business preferences and customer requirements – *End-to-end analysis*
- **Results:**
  - Unconstrained savings: \$71.4 million; 10% reduction in cost
  - Implementable Savings: \$33.4 million; 5% reduction in cost
  - Bid processing cycle reduced from months to weeks





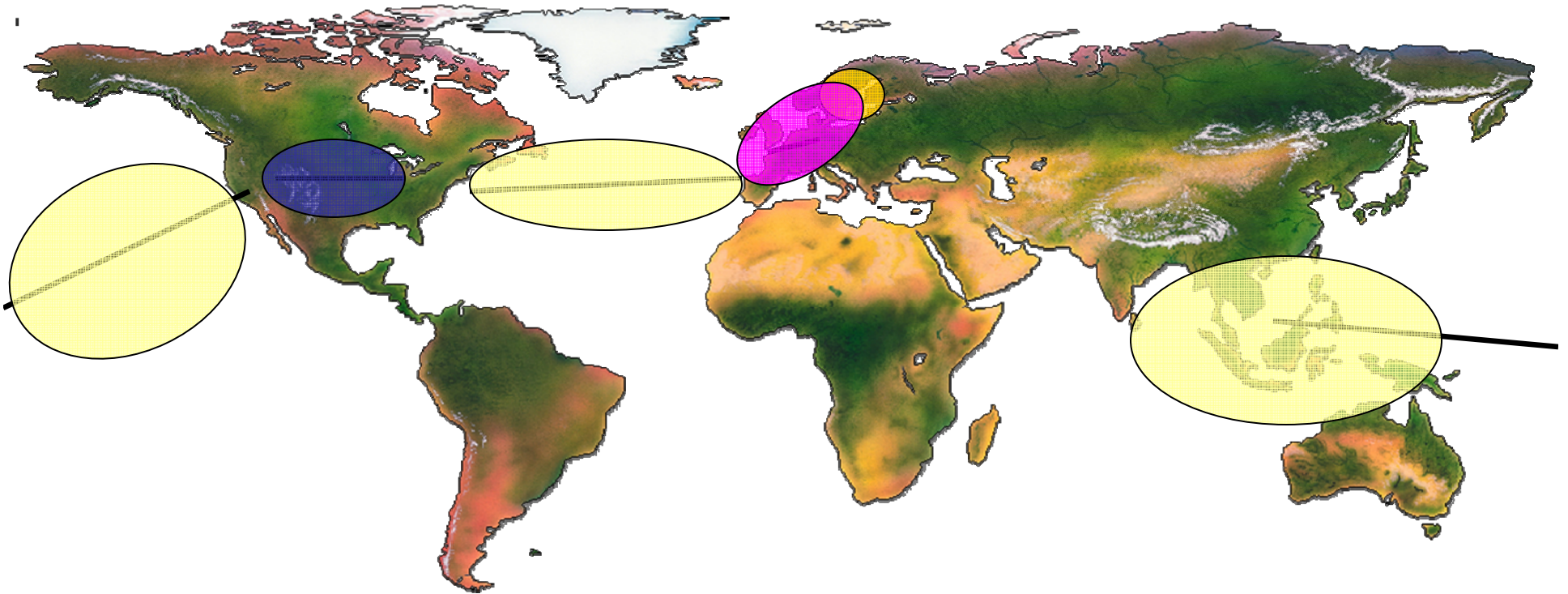
# Case Study: CPG Transportation and Distribution Network Optimization

## ***\$22 Billion Global Household Goods Retailer***

- ***253 retail locations in 35 nations and more than 1,300 suppliers in 50 countries***
  - ***Global supply chain lacked visibility, fostered silos in sourcing global transportation by region and mode***
    - ***EU Full Load, Part Load, NA Truckload, Ocean..***
  - ***Over 30 Stakeholders and 4 Business Groups***
  - ***Value of Contracts Sourced ~\$1 Billion***
- ***Sourced Transportation By Mode/By Geographic Segment***
  - ***Highly Segmented and Fragmented Processes***
  - ***Competing Corporate vs. Regional Buying Strategies***
  - ***Desired to explore new sources of supply – Russia, Eastern Europe, China but did not have rates***
  - ***Established systems and (manual) processes were unable to consider trade-offs across modes (ocean, land, air)***



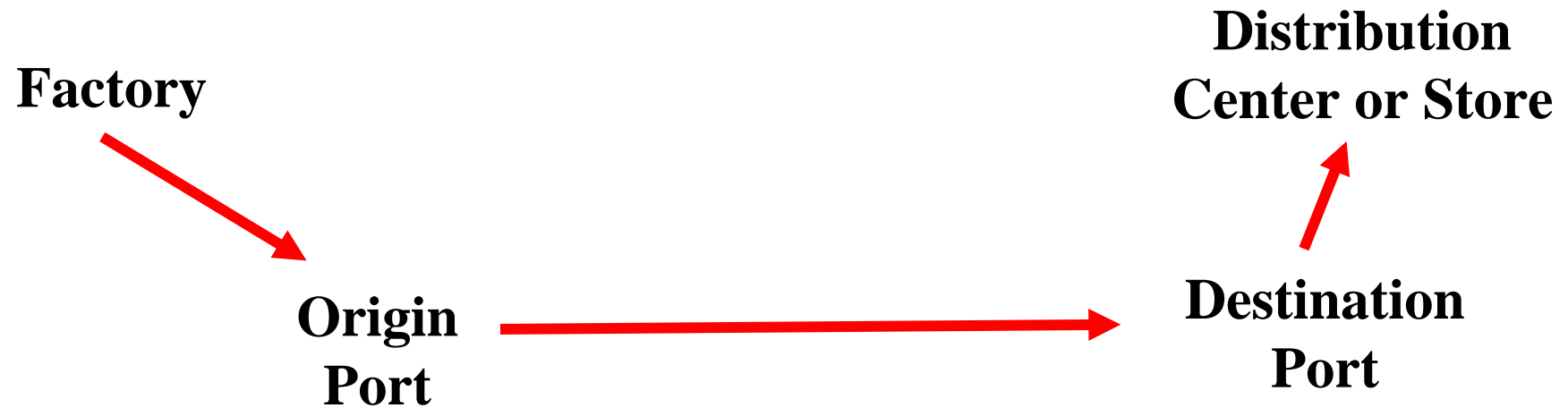
# CPG Business Challenge



- Challenge – *Support senior-level decision-makers with timely analyses*
- Create single distribution system that optimizes mode selection and flow across the network
- Aggregate and source transportation spend across multiple tiers of their supply chain
- Change sourcing processes and strategy

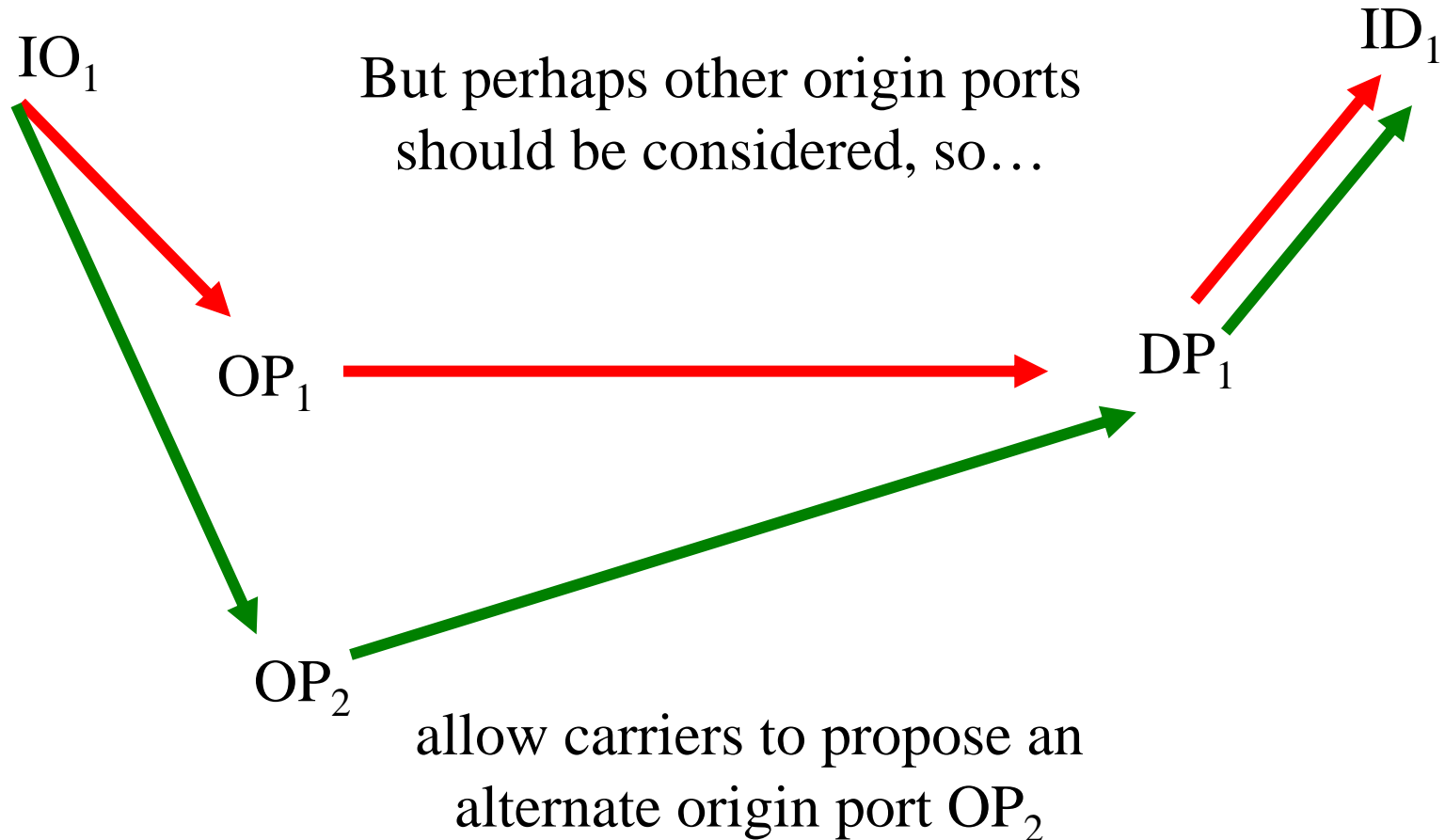


## ***CPG Door to Door with Carrier Supplied Drayage***



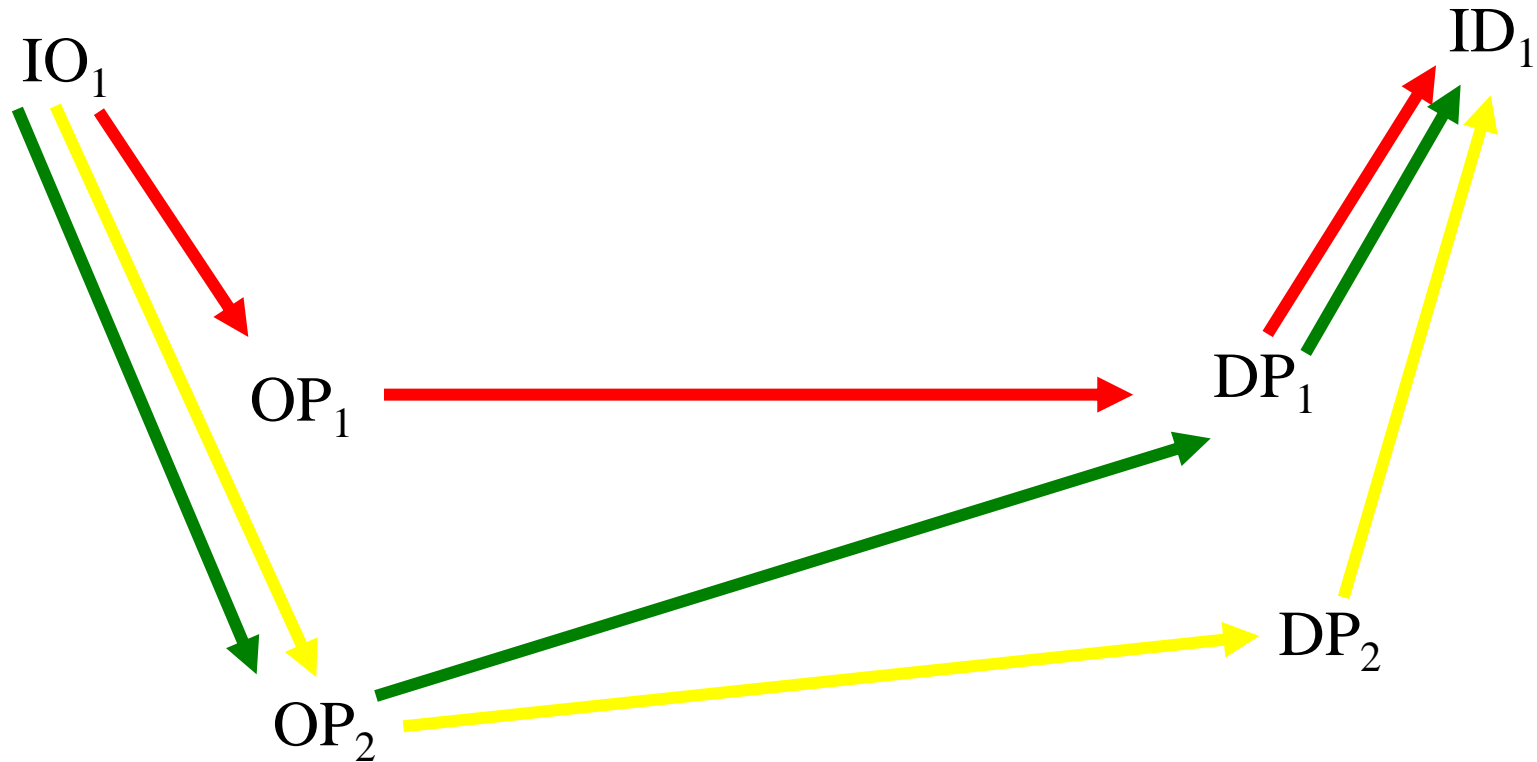


## CPG Door : Door Component Pricing w/Alternate Node Selection





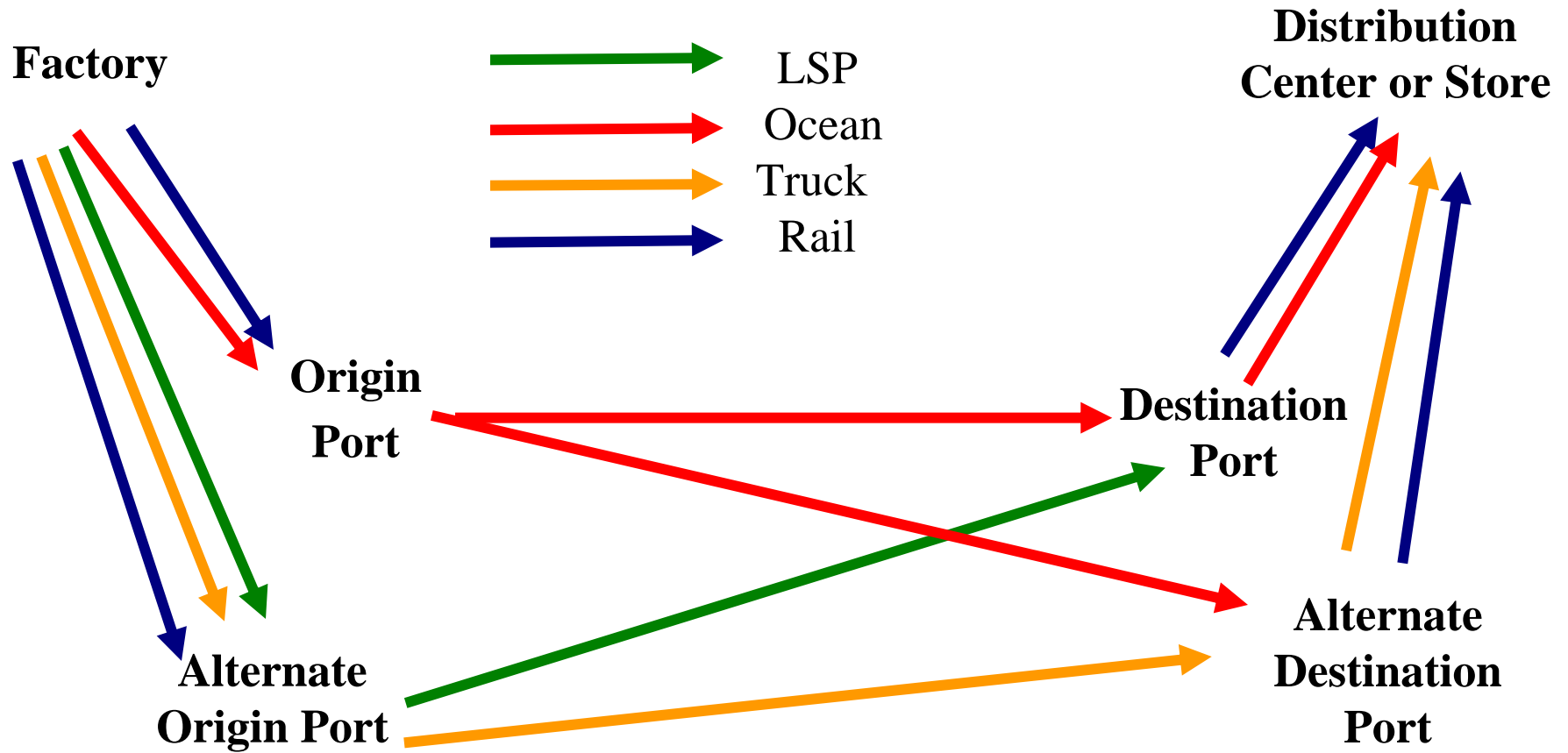
## ***CPG A to D Component Pricing w/Alternate Node Selection***



also permit an alternate  
destination port  $DP_2$



## ***CPG D to D Multi-Mode Component Pricing w/Alternate Node Selection***



Next step: Add alternate land transportation to the origin ports and from the destination ports



# CPG Results

- **Introduced repeatable, advanced sourcing best practice through adoption of self-service web application – *State-of-the-art technology***
- **Introduced Innovative multi-tier supply chain sourcing process to understand implications and trade-off effects during the sourcing process – *End-to-end analysis of mobility and transportation requirements***
- **Attained Global Rate Visibility to all equipment types in needed to use across all modes – *End-to-end analysis of mobility and transportation requirements***
- **Reduced Sourcing time from months to weeks – *Supports senior-level decision-makers with timely analyses***
- **Enabled stakeholders to represent and justify the costs of business needs – *Supports senior-level decision-makers with timely analyses***



# Strategic Deployment Planning

- ***How its done today***
  - ***Strategic assets allocated at top level***
  - ***User determines mode***
  - ***Analysis based on transportation feasibility***
  - ***Trial and error***
- ***Recognizing a better approach***
  - ***Aviation Battalion, 10<sup>th</sup> Mountain Division deployment to Afghanistan – Distribution Process Owner overrides user mode request***
  - ***DPO optimizes mode selection to reduce cost, conserve strategic deployment assets while meeting or improving RDD***
- ***Is This Capability Needed on a Larger Scale?***



## AT-21 Program Scope\*

***Modernize deployment and distribution planning business processes and provide decision support tools that produce optimal intermodal distribution solutions to drive efficiencies***

### Deployment (Annual)

- ***More than 590,000 people***
- ***More than 640,000 short tons; 14,198,000 Sq ft***
- ***768 Origins***
- ***826 Destinations***
- ***331 Ports of embarkation***
- ***314 Ports of debarkation***

### Sustainment

- ***32,000 truck loads/month***
- ***9,000 containers/month***
- ***10,000 463L pallets/month***

### ***Complexity?***

- ***768 Origins***
- ***826 Destinations***
- ***634,368 O-D pairs alone!***

***\*Source: AT21 Industry Day Presentation, October 31, 2006***



## **Case Study (Force Readiness/Projection): *Global Force Visibility Application***

- ***Optimal Troop Deployment while considering all real and potential constraints:***
  - ***Strategic guidance to prioritize/eliminate units for deployment***
  - ***Comprehensive inventory of forces required to meet emergent and rotational requirements***
  - ***Visibility of measured readiness for units to meet the requested force/capability.***



# Global Force Visibility, Deployment and Resetting the Force

- **Force Readiness**

- **Unit SORTS Measures:**

- Training levels
    - Personnel: Fill, and MOSQ levels,
    - Supply: Equipment O/H, Fleet
    - Maintenance

- **Unit Capabilities/Missions**

- METL, JMETL
    - Capabilities
    - Availability

- **Individual**

- TTHS Account
    - HD/LD MOSs

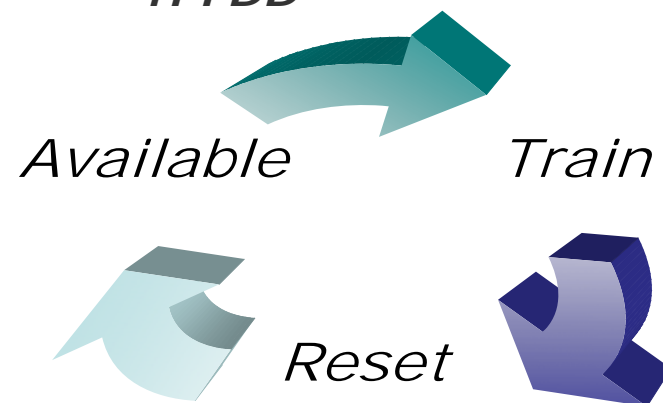
- **PERSTEMPO/OPTEMPO**

- **Materiel**

- Supplies
    - Fleet
    - Commodity: fuel, water
    - TPFDD

- **Strategic Mobility**

- **Lift Capabilities:**  
*Railheads, Ports, and Airfields*
  - **Lift Capacities:** *Transport (Truck, Air, Ship, Rail), Ports, Airfields*
  - **Forces Deployment Visibility**
  - **COCOM Plans OPLAN, CONPLAN, OPLAN**
  - **TPFDD**





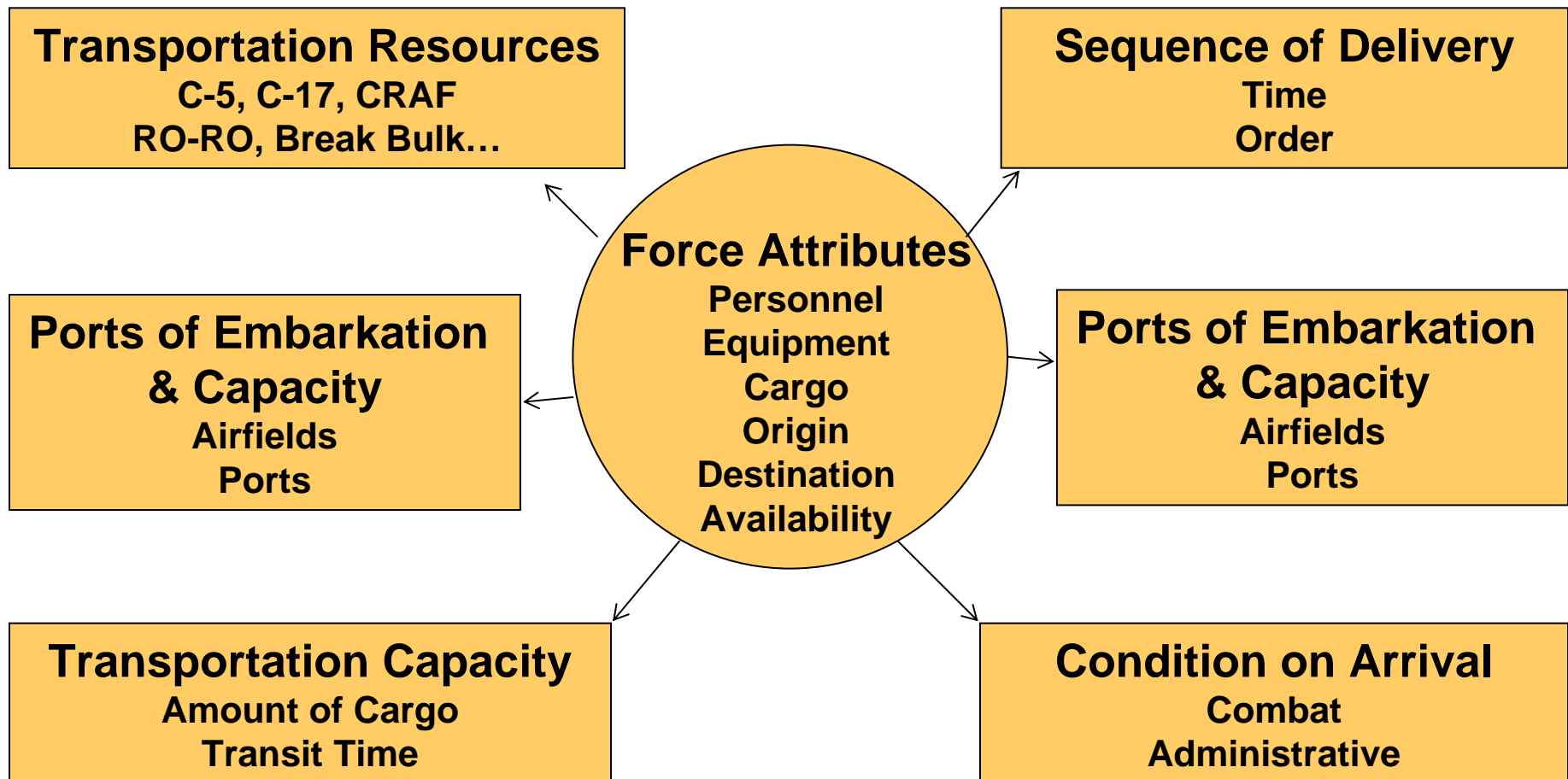
# Optimizing the Equipment Challenge

- ***Mission: Optimize Allocation of equipment among competing priorities to enhance readiness at lowest total cost of ownership***
- ***Variables***
  - *Modernized equipment*
  - *Roll-down equipment*
  - *War reserve stocks/pre-positioned stocks*
- ***Business Rules:***
  - *Favor redeploying units*
  - *Redeploying units get modernized equipment and transformation*
  - *Synchronize with training and deployment schedules*
  - *Match equipment of deploying units to prepositioned stocks*
  - *Match equipment to modernization / transformation plans*



# Optimizing Strategic Deployment

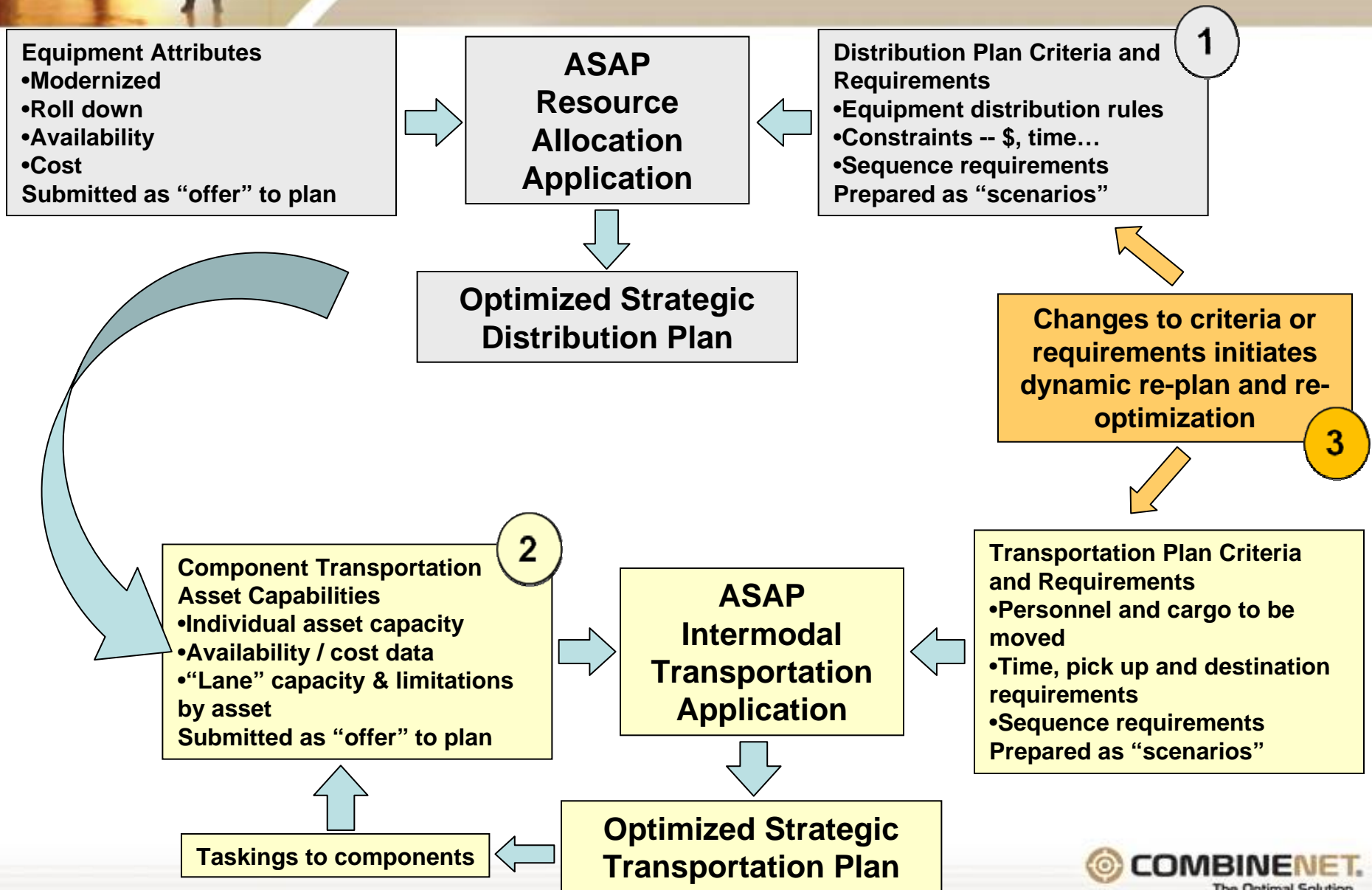
***Mission: Optimize the allocation of transportation resources for strategic movement***





# A Possible Solution

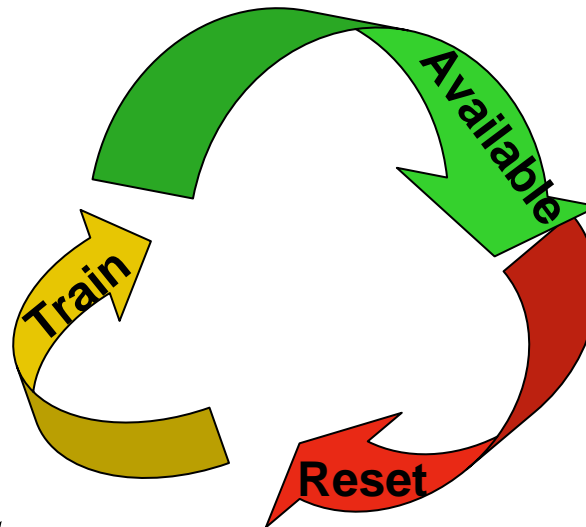
- ***Use CombineNet's Advanced Sourcing Application Platform optimize:***
  - ***Distribution of resources – materiel, dollars, time – to meet force readiness, modernization and deployment goals and rules***
  - ***Allocation of transportation resources to meet strategic deployment requirements while conserving time and money***
- ***Employ CombineNet's rapid scenario-building and solving capability to re-optimize allocation as constraints and requirements change***
- ***Ability to vary rules, constraints, criteria...but also vary alternatives***





# Benefits

- ***Visibility to the Reset Problem***
- ***Optimization and synchronization of resources***



- ***Functionality***
  - ***Models real world complex problems***
  - ***Supports Scenario-Driven “What-if Drills”***
  - ***Full transparency / encourages collaboration / eliminates unnecessary constraints***



# Conclusions

- **Commercial best practice in use by the leading companies – *State-of-the-art technology***
- **Capability to understand and exploit enormous complexity – *End-to-end analysis of mobility and transportation requirements***
- **Detailed analyses orders of magnitude faster than other technologies – *Support senior-level decision-makers with timely analyses***